PRESERVICE TEACHER PREPARATION FOR APPLICATION OF DISCUSSION TEACHING METHOD IN SECONDARY SCHOOL SCIENCE LESSONS

Rose Atieno Mutende[a], (**Corresponding Author**), Dr. Rosemary Khitieyi Imonje[b]

[a]Department of Science and Mathematics Education,

Kibabii University, P.O Box 1699-50108, Bungoma, Kenya.

Email: rose.atieno@students.uonbi.ac.ke

[b]Senior Lecturer, Department of Educational Administration and Planning,

University of Nairobi, Kenya P.O Box 30197-00100, Nairobi, Kenya.

Email: imonje77@gmail.com

Abstract

The purpose of this paper is to examine the Bachelor of Education (B.Ed) Science students' preparation for application of discussion teaching method in secondary school science lessons. Data were collected through questionnaires, interview schedules, and scores awarded on teaching practice. The data were analyzed descriptively and inferentially. The principal results showed (i) There was little skill transfer from the university-based learning to the classroom context (ii) The classroom can be a potential learning context if appropriate technical support is provided. (iii) Most of the developmental needs were not addressed in the classroom context despite the supervision provided. (iv)There is a significantly strong positive correlation between Discussion Teaching Method and TP performance. The study concluded that the Discussion Teaching Method as taught in the university-based subject Methods Course is limited in experiential learning opportunities hence does not adequately develop pedagogical understanding of particular instructional practices that constitute the Discussion Teaching Method.

Key words: Constructivism, Discussion, Teaching Method, teaching practice, Performance

1.1 Background to the Study

The discussion teaching method is a verbal engagement in and a practice of the activities of thought and is akin to natural communication. In a curriculum that aims to impart knowledge and understanding, process skills and attitudes, as well as bodies of information, discussion as an instructional method is indispensable. However, facilitating a discussion in a science lesson has been found to be challenging particularly for novice teachers. The reason according to Fry, Ketteridge and Marshall (2009) is that science concepts do not always present explicit facts for discussion. Thus to effectively facilitate discussions in a secondary school science classroom , the B.Ed Science students need to be good discussants themselves and equipped with the conceptual and practical tools for instructional practices that constitute the Discussion Teaching Method.

The Discussion Teaching Method comprises particular research-based specific teacher activities of planning, structuring and presenting a learning material that trained teachers are expected to demonstrate in an interactive and effective learner engagement. Researchers have deconstructed teaching methods into specific instructional practices (Lampert, & Franke, 2009; Ball, Grossman & McDonald, 2009, and Kazemi, & Forzani, 2009). Grossman, Hammerness, & McDonald, 2009) suggests a model of professional preparation for teachers that comprise step-by-step procedure of representing a practice (such as a teaching method), decomposing the practice, and approximating that practice for enactment. This implies that preparation of preservice teachers for facilitation of a classroom discussion entails teacher educators creating opportunities for a 'practice discussion' where groups of preservice students select content in the curriculum and plan to teach using particular instructional practices that constitute the Discussion Teaching Method. Grossman (2010) further propose the inclusion of 'model discussions,' and posits that emphasis should be on developing the preservice teachers' pedagogical understanding of specific instructional practices that constitute the Discussion Teaching Method. Instructional practices that constitute a teaching method represents the sequence of activities that preservice teachers need to develop adequate pedagogical understanding. Adequate pedagogical understanding will enable preservice teachers to effectively apply the Discussion Teaching Method as well as become good discussants themselves.

Dillman (2009) explains that to accomplish a discussion, the teacher needs ability to design open-ended problems for discussion, and allow learners to express their view points but press them for explanations that are evidence-based, while seeking clarifications. This presents an opportunity for the learners to deliberate and reflect on the multiple perspectives of the issue or phenomena of discussion, as well as examine and critique their own and peers views. Therefore, competency in the application of Discussion Teaching Method is established by the teachers' ability to demonstrate fluency in the instructional practices of facilitating students' to present multiple points of view of issues, and make evidence-based arguments for their opinions (Fogo, 2014 and Walshaw & Anthony, 2008). Grossman (2010) notes that in order to develop fluidity with the instructional practices that constitute the Discussion Teaching Method, preservice teachers require multiple opportunities to repeatedly rehearse them. The university-based experiential learning coupled with the school-based teaching practice provide such an environment which is appropriate for approximation of the practices, and the immediate, targeted feedback (Grossman et al., 2009).

A review of studies done on application of Discussion Teaching Methods in science teaching (Morgan, Whorton, & Gunsalus, and Casado, 2000; Rahman, et. al., 2009 van Zeet, Iwasyk, Kurose, Simpson, & Wild., 2001; Bridges, 1987; Nystrand, Wu, Gamoran, Zeiser, & Long, 2003; Sampson, 2009 and Sampson and Blanchard, 2012) show that secondary students face challenges in regard of understanding and participating in classroom discussions, and with reports that teachers themselves are not effective discussants nor facilitators of scientific argumentation. While most studies on application of discussion as a teaching method focus on its influence on the learner outcomes without examining the effects of the instructional practices that constitute discussion on learner outcomes, the current study focuses on Discussion Teaching Method as an outcome of science teacher education curriculum.

1.1.1 Statement of the Problem

Teaching as a profession is charged with the immense task of developing expertise for human capital and social justice (World Bank, 2018). Yet, teacher preparation programs are criticized for teaching the theory of education that does not connect to the practice of teaching, and that they produce teachers who have limited skill transfer from the university-based learning to the classroom context (Darling-Hammond 2010 a; Roofe and Miller, 2013 & Zeichner, 2010). What is not clear is how preservice science teachers are prepared for effective application of the teaching methods, and the influence that their learning has on their applications of the Discussion Teaching Method in real classrooms. This being the case, the way preservice teachers form their knowledge of Discussion Teaching Method, and the ways in which they learn to put in practice their theoretical learning, are issues of concern. This study therefore sought to investigate preservice teacher preparation for application of the Discussion Teaching Method in science subject lessons at secondary school.

1.1.2 Objective

To examine the influence of instructional practices on application of Discussion Teaching Method.

1.1.3 Hypothesis

The null hypothesis formulated from the objective was H_01: The instructional practices have no significant influence on the application of the Discussion Teaching Method.

1.2 Methodology

1.2.1 Research Design

The current study sought collect information on the opinions, practices and perceptions of the participants regarding preservice teacher preparation for application of discussion teaching method in secondary school science lessons. Given the varied study participants (B.Ed science students, the HoS in their TP schools and the faculty who taught subject methods course) it would have been difficult to understand the *what* and the *how* of the teacher preparation based on only a relationship of the dependent and independent variables and without having an in-depth understanding of the same. Orodho (2003) asserts that a survey research design allows for collection of vital data through questionnaires and or interviews to a selected sample of respondents. Hence, the current study adopted the descriptive survey design (Cohen, Manion & Morison, 2007, Mugenda & Mugenda, 2012). Accordingly, use of the descriptive survey design made it possible to observe, describe and document aspects of B.Ed Science teacher preparation as it naturally occurs (Fraenkel and Wallen, 2000).

1.2.2 Target Population

The target population of the current study to whom the survey applies, and about whom, as Enarson, Kennedy and Miller (2004) claims, conclusions and recommendations of the survey are made, and to whom a generalization of the results will be made (Mugenda and Mugenda, 2003) was 145 B.Ed Science students who had completed and passed the Subject Methods course, hence qualified to proceed for the May-August 2017 TP session), their respective HoS in the TP schools and the faculty for the three science subjects. The sample size was calculated using Yamane (1973) formula for sampling to determine the desired sample size for the study. From the target population, the sample size was obtained as follows;

$$n = \frac{145}{1 + 145(0.05^2)} = 106.422 \approx 107\ students$$

The study also made use of purposeful sampling an equal number of HoS and 3 faculty (Cohen et al 2007) because the researcher needed respondents who are experienced and therefore satisfied important criteria and were deemed relevant to the study (Gall, Gall & Borg, 2007). Although not a nationally representative sample, the sampled B.Ed Science student at UoN were in many ways similar to B.Ed Science students in all universities nationwide in terms of the B.Ed Science Degree program they undertook. The HoS sample was representative of all the HoS in secondary schools nationally, while the 3 faculty at UoN were representative of all faculties who teach subject methods in universities that offer secondary science teacher education globally.

1.2.3 Data Collection

In the context of this study therefore, demonstration of application of instructional practices that constitute the Discussion Teaching Method enabled the practicalization of the method into observable and measurable activities. This made it possible to identify what the B.Ed Science student know and can do as a result of their learning in the subject methods. As argued by Harlem (2015), instructional practices that describe agreed aspects of a teaching method determines the data to be collected and the criteria for judging whether the application of the teaching method is or is not meeting the expected standards.

To obtain participant views, two questionnaires utilizing the Likert Scale were constructed to determine the sampled B.Ed Science students and the HoS views while a guided expert interview Schedule was administered to faculty. Factor analysis was used to measure whether the instrument items measure the construct they belong to (Field, 2013). Specifically, Bartlett's test of sphericity (significant at $p \leq 0.050$), was conducted to determine whether the original correlation matrix is equal to an identity matrix. The second key test was the Kaiser-Meyer-Olking (KMO) employed to measure the sampling adequacy whose value lies between 0 and 1 (Field, 2009). With regard to validity, the KMO test results for sampling adequacy scales of the factors and the results of Bartlett's Test of Sphericity showed acceptable degree of sampling adequacy, hence the constructs were verified to be valid and therefore fit for further analysis (Saunder et. al., 2007). To ensure internal consistency, the instruments had enough items to provide good coverage of the Discussion Teaching Method and the activity of each item was clear to create uniformity in understanding by all study participants. Internal consistency was tested using Cronbach's Alpha of coefficient test (Drost, 2012). Cronbach's alpha coefficient test results were found to be 0.74 for teaching practice supervision and assessment, and 0.78 for the Discussion Teaching Method. This surpassed the 0.6 lower levels of acceptability (Hair, Black, Babin, Anderson, & Tatham, R. 2006) and was above 0.70 as suggested by Nunnally (1978), hence the data were reliable and acceptable for further analysis.

1.2.3 Data Analysis

Investigation of the Discussion Teaching Method as learnt in the university-based subject methods course is a social phenomenon and cannot therefore be measured directly. Therefore, the researcher used descriptive statistics to describe and summarize the variables. Inferential statistical tools used were the Standard Linear Regression model to test for the hypothesis so as to determine the contribution of the Discussion Teaching Method in predicting the B.Ed Science students' performance as well as the partial effect of the Discussion Teaching Method on the TP Performance of the B.Ed Science students. Additionally, regression analysis was used to determine the nature and magnitude of the relationship. Correlation analysis was used to determine the nature of the relationship between application of the Discussion Teaching Method and the teaching practice performance of the sampled B.Ed Science students.

To compute multiple regression, the data were assessed for statistical assumptions and it was found that the data set did not violate the assumptions of normality, homoscedasticity, nor outliers and linearity, hence then the dataset set was reliable and fit for multiple regression modeling. Moderation analysis was used to determine the moderation effect of TP supervision and assessment on the relationship between the Discussion Teaching Method and the Teaching Practice performance of the sampled B.Ed Science students. Both analyses were used to test the research hypotheses at significance levels of 0.05.

Data for TP performance was obtained from scores on the Lesson Development Component of the official Teaching Practice supervision form. The Lesson Development Component comprises a general score on the observed mastery, treatment and sequence of content, appropriate use of teaching methods such as lecture, discussion etc, learner involvement, and is scored out of 25 marks. The score attained was recorded at two different times, ie at the onset and towards the end of the teaching practice session, as well as the overall scores. This was done to establish the

performance scores in the Lesson Development Component scores (out of 25%) of the Teaching Practice and Assessment form. In the Lesson Development Component the B.Ed Science student is scored on their fluency to apply particular teaching methods by assessing and then assigning a score.

Four ethical principles of respect, competence, responsibility and integrity were observed and applied throughout the study (BPS, 2006), and concern for participants' interests were emphasized (Barrett, 2007; BPS, 2006; Cohen et. al. 2007).

1.3 Results and Discussion

1.3.1 University-Based Teacher Preparation for Application of Discussion Teaching Methods

The student questionnaire sought to establish the sampled B.Ed Science students' experience of learning how to apply teaching methods in the subject methods courses for science subjects. The statements were anchored on a Likert-type scale and respondents were asked to indicate the extent to which they agreed to the statements as shown in table 1.

Finding of item 1 and 2 showed that the B.Ed Science students attributed the instructional practices that constitute particular teaching methods that they adopted to the university-based subject methods course. The finding of items 3-6 revealed that the B.Ed Science Degree Program comprised an experiential learning component whose learning tasks were modelled on practices in a context similar to which they would apply the teaching methods. The results of items 7 – 10 revealed that the practical aspect of the subject methods course comprised experiential learning designed to expose the B.Ed Science students to approximations of classroom practices. A minority however, reported that they did not find the subject methods course relevant for their learning how to teach. The results of items 11-13 revealed that the B.Ed Science students found the microteaching sessions insufficient for their learning how to apply the teaching methods in lessons because they did not get adequate opportunity for approximations of practice which is key in transferring theory into practice.

This finding establishes that the B.Ed Science curriculum is cognizant of the fact that the theory of learning connects to experience and is thus geared towards accelerating B.Ed Science students' development of instructional practices that constitute teaching methods. . Additionally, the findings illustrate that collaborative reflection and repeated instructional practices help B.Ed Science students to identify the mis-matches between their prior knowledge and understanding, and current instructional practices, and provide the possibility to hone them. Thus the university-based learning of application of the Discussion Teaching Method enhances development of conceptual and practical tools of teaching among the B.Ed Science students. However, a shortcoming noted is that the B.Ed Science students in the current study were not engaged in multiple cycles of planning, teaching, and reflection. Instead they had single sessions each without the opportunity to re-plan and reteach the instructional practices. Nevertheless, they collaboratively reflected on their teaching and received feedback from peers.

1.3.2 Descriptive Analysis of Application of Discussion Teaching Method

The sense made by the B.Ed Science students in application of teaching methods is inferred from their ability to demonstrate instructional practices that constitute a teaching method that they adopted, and which they had learnt earlier in their university-based subject methods course. Focusing on the instructional practices that constitute the Discussion Teaching Method made it possible to identify what the B.Ed Science student know and can do as a result of their learning how to apply the Discussion Teaching Method in the mandatory university-based Subject Methods Course. The researcher thus conducted a descriptive analysis of the HoS opinion of the B.Ed science students' application of instructional practices that constitute the Discussion Teaching Method both at the onset and at the end of the teaching practice session (Tables 2 & 3). The results revealed that although majority of the B.Ed Science students acquired their pedagogical knowledge, understanding of instructional practices that constitute the Discussion Teaching Method during the university-based subject methods course, the skill transfer to the classroom context was limited. This is evidenced by the total average score of application of Discussion Teaching Method at the onset of TP, *Mean = 2.9644 (59.3%), SE = 0.05763* and towards end of the TP *Mean = 3.2812 (65.6%), SE = 0.0742*.

Additionally, results of Table 4 showed a slight significant difference of 6.3% in the skills of applying Discussion Teaching Method, [*Mean Difference=0.31381(6.3%), SE= 0.08999, t = 3.487, df= 105, p_value = 0.001< 0.05*]. As much as the difference was not large, it was significant. The slight improvement of 6.3% noted over the TP session indicates that the sampled B.Ed Science students' conceptions of how to facilitate a Discussion was mainly developed during the university-based subject methods course, but that the classroom is a potential context for adoption of instructional practices previously undeveloped, and more so the honing of instructional practices that may have been inadequately developed.

This finding is consistent with the literature finding of a study by Chen, Cao and Zhang (2016) who found that prospective teachers find difficulties applying the Discussion Teaching Method because they have insufficient experience in the application of the Discussion Teaching Method hence inadequately developed discussion skills. Consequently, they cannot effectively apply the Discussion Teaching Method. Development of discussion skills require practice of time coupled with assessment of practical application in lessons, hence, experience. While the finding of Chen, Cao and Zhang can explain the reasons why the B.Ed Science students found application of the Discussion Teaching Method challenging, their study did not focus on the instructional practices that constitute the discussion method as in the current study. The teaching practice supervision served to address the B.Ed Science students prior (mis)conceptions of instructional practices, guided, assessed and supported to increase the possibility of developing fluency in the instructional practices that will lead to improved application of the Discussion Teaching Method and ultimately the B.Ed Science student performance on TP.

1.3.3 Supervision Practices

The sampled B.Ed Science students on TP were asked to state the practices of their respective HoS and university supervisors during their school-based experiential learning. The findings were as indicated in table 5 (B.Ed Science students opinion of the supervision practices of the HoS) and table 6 (B.Ed Science students opinion of the supervision practices of the university supervisors).

1.3.3.1 Supervision Practices of the HoS

All the B.Ed Science students were exposed to HoS who had experience in the application of teaching methods at secondary schools and therefore were expected to be able to demonstrate application of the Discussion Teaching Method effectively (Mergler & Tangen, 2010). However results showed that majority of the sampled B.Ed Science students were dissatisfied with the supervision practices of their respective HoS. There was no schedule for supervision by the HoS and therefore the lesson observations were limited and therefore did not provide the B.Ed Science students with adequate and appropriate technical support that they required to improve their application of the Discussion Teaching Method. According to Zepeda (2013) formative supervision and assessment is the basis towards the improvement of application of a teaching method. This classroom-based supervision is essential because the mandatory university-based experiential learning cannot anticipate all the context-specific challenges that the B.Ed Science students may encounter in the unique environments of individual schools and classrooms. Milanowsik (2011), advice that for classroom observations to influence fluency in teaching practices, the supervisors should have an in-depth understanding of the subject being taught and should be trained in the use of supervision rubrics. This finding is consistent with the findings of a study reported by Tesfaw & Hofman (2012). The study found that beginning teachers' perceived good instructional supervision as that which addresses their professional needs, offers them technical support, gives them help and advice and strengthens a sense of collaboration and trust.

1.3.3.2 Teaching Practice Supervision Practices of the University Supervisors

The results of University supervision practices (Table 6) showed that overall, the total average score of TP supervision by University supervisors was 3.1939 (63.9%), an indication that approximately 63.9% of sampled B.Ed Science students on TP were satisfied by the supervision practices of their respective university supervisors, while approximately 36.1% were dissatisfied with the supervision and assessment by their respective university supervisors. These results imply that the university supervisors' availability was limited since their visits were scheduled. However, when they made their classroom visits, they provided adequate and appropriate technical support. The keen supervision of professional documents implies that the B.Ed Science students are trained in accordance with standards and policies of MoE. Orenaiya (2014) counsel that it is imperative for supervisors to review teaching artefacts to establish relatedness, completeness of teaching tasks and syllabus coverage. However, on classroom visits for supervision and assessment, Tesfaw and Hofman, (2014); Campbell, (2013) Milanowski, (2011), and Marshall, (2009) contend that formal classroom observations impact on teaching practices which they point out are best in establishing whether teachers are employing effective pedagogical practices and meeting the set teaching standards (or not).

Overall, the findings suggests that although supervision practices have the potential to influence the B.Ed Science students adoption of instructional practices, most of the developmental needs of the B.Ed Science students cannot be addressed in the classroom context if supervision and technical support is limited.

1.3.4 Inferential Analysis of the Discussion Teaching Method

The hypothesis generated was: *H_0: The instructional practices have no significant influence on the application of the Discussion Teaching Method*. A regression analysis was performed to examine the effect of applying the Discussion Teaching Method on the TP performance of B.Ed Science students. Results showed that application of Discussion Teaching Method had a statistically significantly unique contribution in the prediction of the TP Performance of the sampled B.Ed Science students (β =.578, t = 5.918, p=0.01<0.05). The results of the Zero order Correlation indicated a significantly strong positive correlation between Discussion Teaching Method and TP performance of B.Ed Science students ($R = 0.419 > 0.5, p = 0.000 < 0.05$). With a Part Correlation Coefficient of 0.301, it uniquely explained 0.301^2 = 9.06% of the variation in TP performance of B.Ed Science students. Notably, the Discussion Teaching Method had a positive standardized beta coefficient = 0.552 in the coefficients results, an indication that a one unit improvement in the application of Discussion Teaching Method is likely to lead to a rise in the TP performance of B.Ed Science students by 0.552 standard deviations units. These results point to inadequate pedagogical understanding of instructional practices that constitute the Discussion Teaching Method, and this explains the B.Ed Science students' seemingly limited fluency in application of the Discussion Teaching Method, hence the comparatively low performance on teaching practice.

1.3.5 Teaching Practice Performance of B.Ed Science Students

To determine the performance of the B.Ed Science students in regard of application of teaching methods, the researcher considered the Lesson Development Component score on the official teaching practice supervision and assessment form as assessed by the university supervisor first at the onset and again towards end of TP. The results were as indicated in tables 7 and 8. Results of table 7 shows that at the onset of the TP session, the sampled B.Ed Science students on TP had an average Lesson Development Component score of 16.97 which was slightly lower than that at the end of the TP session, 17.48. With regard to the variation in the Lesson Development Component scores, the results showed that for Pair 2 the mean difference was not significant towards the end of the TP session compared to the beginning of the TP session [*Mean Difference=0.553, SE = 0. 333, $t = 1.660$, $df = 102$, $p\_value = 0.001 < 0.05$*]. The mean difference of .553 on the Lesson Development Component performance results revealed that despite the experiential learning provided to the B.Ed Science students both at university and on TP, they still developmental needs. This implies that ways and means of identifying the "difficult" instructional practices that constitute the Discussion Teaching Method and how best to improve how the B.Ed Science students learn to adopt them needs to be explored. Notably, the B.Ed Science students in their demographic information indicated that they regarded experiential learning both on campus and in real classrooms as beneficial to their learning and therefore important. However, they generally reported their need for more university-based experiential learning sessions, increased technical support during the school-based teaching practice, and provision of adequate

teaching and learning resources so as to promote their application of teaching methods and thereby enhance their TP performance.

The results reveal that the average performance witnessed on the Lesson Development Component was generally maintained over the TP period. This points dismal improvement perhaps due to limited technical support. Additionally, the B.Ed Science students encountered systemic challenges and barriers emanating from both the university and their TP schools and which they clearly pointed out. Perhaps, if these had been addressed the Lesson Development Component scores would have been higher. Further, the B.Ed Science students reported that the mandatory university-based subject methods course which they are provided to learn how to apply teaching methods as applied during science subjects' lesson was beneficial to their learning how to teach, implying that the knowledge and skills acquired went a long way into contributing to their performance in the Lesson Development Component. However, they reported that although their HoS were available and accessible, their supervision was not geared towards helping them improve their application of teaching methods during lessons. They lauded their university supervisors for providing relevant support regarding their application of teaching methods even though their visits were limited.

On the whole, the mean difference of .553 on the Lesson Development Component performance results suggests that the B.Ed Science students have the capacity for immediate improvement in their application of teaching methods if the university-based and school-based experiential learning is geared towards stimulating their development as effective teachers, appropriate technical support is provided, and the challenges experienced are addressed. This finding resonates with the finding of a study carried out by Gary, Kevin and Fortner which showed that teachers' effectiveness in the classroom improves substantially between their first and second years on the job. Since teacher performance during a lesson is determined by application of teaching methods applied for the learning materials, Coskuner, (2001) and Hismanoglu & Hismanoglu, (2010) advice that to meet the learning needs of students, beginning teachers need support to address their own developmental needs first before they can facilitate learning in real classrooms.

1.4 CONCLUSIONS OF THE STUDY

1. Due to lack of prior experience with Discussion Teaching Method in their own learning first as students and secondly as preservice teachers, the B.Ed Science students did not adequately develop the pedagogical understanding of the method. Consequently, they came to teaching practice with limited existing knowledge of application of the Discussion Teaching Method, hence limited contribution to performance on teaching practice.
2. The increase in the number of B.Ed Science students who adopted the instructional practices that constitute the Discussion Teaching Method while on TP implies that the B. Ed Science students have the capacity for immediate improvement in their application of the Discussion Teaching Method, and that the secondary school classroom can be a context in which to adopt instructional practices or hone those that were superficially developed if the required technical support is provided.

3. The mean difference of 6.3% realized in the application of Discussion Teaching Method of over the course of TP session was not large though significant as it implied that the Discussion Teaching Method as applied by the B.Ed Science students on teaching practice, is not as efficient as it should be, hence ways and means of improving the efficiency and effectiveness of Discussion as a method of teaching need be explored with emphasis on the instructional practices that that majority of the B.Ed Science students had inadequate pedagogical understanding.
4. Although the HoS were experienced, available and accessible by the B.Ed Science students on TP, their supervision practices did not adequately support the B.Ed Science students to connect with their existing knowledge about teaching what is expected of them in the classroom.
5. The B.Ed Science students' encountered systemic challenges and barriers during university-based and school-based experiential learning hence they had developmental needs that were yet to be addressed.

1.5 RECOMMENDATIONS FROM THE STUDY

1.5.1 Recommendation for Policy

1. Endorse systemic initiatives to re-orient the university-based subject methods course to enhance the set of instructional practices that constitute the Discussion Teaching Method and promote adoption of the same by the B.Ed Science students. These should include adequate collaborative reflection opportunities for the B.Ed Science students to repeatedly practice, analyze and re-teach mini-lessons in novel ways.
2. Lobby for the development of an institutional mechanism at secondary schools to encourage the HoS to provide technical support on application of the Discussion Teaching Method by enhancing teacher appraisal to include the instructional practices that constitute the teaching methods. This will encourage and support ongoing professional development for B.Ed Science students while on teaching practice.

1.5.2 Recommendation for Practice

1. Design a portfolio of coherent learning experiences of B.Ed Science students on application of the Discussion Teaching Method that relate to their individual and context-specific needs in partnership with the HoS and the MoE as appropriate. Then using a broad conceptualization of teacher learning opportunities derived from both research and practice, enhance and promote the B.Ed Science students' approximation of the instructional practices in settings that simulate the secondary classrooms. This will provide the needed developmental support and initiate the development of own frame of reference about application of teaching methods.
2. To address the existing misconceptions and inadequacies in regard of preparation, presentation and structure, and to promote learning opportunities for B.Ed Science students, the HoS and faculty should model the Discussion Teaching Method.

1.5.3 Recommendation for Future Research

1. Further research is needed in the development of preservice teachers' adoption of instructional practices that constitute the Discussion Teaching Method as used in the secondary school science lessons, and how this knowledge influences the B.Ed Science students' achievements regarding application of the Discussion Teaching Method.

References

Ball, D., & Forzani, F. (2009). The work of teaching and the challenge for teacher education. *Journal of Teacher Education*, Vol. 60(5), Pgs 497 – 511.

Barrett, P. (2007), "Structural Equation Modelling: Adjudging Model Fit," *Personality and Individual Differences*,

British Psychological Society (2006). Code of ethics and conduct. Leicester: British Psychological Society.

Bridges, D. (1987). Discussion and questioning. *Questioning Exchange*. Vol. 1. Pgs. 34-37.

Campbell, K. H. (2013). A Call to Action: Why We Need More Practitioner Research. A response to "A Teacher Educator Uses Action Research to Develop Culturally Conscious Curriculum Planners". *Democracy and Education*, Vol. 21 (2), Article 7.

Casado, M. (2000). Teaching methods in higher education: A student perspective. *Journal of Hospitality and Tourism Education. Vol. (*12). Pgs 65-70.

Ciminelli, M. (2009). Learning to Teach in a Constructivist Teacher Education Environment. Institute for Learning Centered Education.

Cohen, L., Manion, L., & Morrison, K. (2007). Research methods in education (6th ed.). New York.

Conskuner, M. (2001). Turkish provincial state university teachers' perceptions of English language teaching as a career (Unpublished M. A. Thesis, Bilkent University, Ankara).

Darling-Hammond, L. (2010a). Evaluating teacher effectiveness. Center for American Progress. San Francisco: Jossey-Bass.

Dillman (2009). Education programs & practices. *Teaching & Teacher Education,* Vol. *22,* Pgs 1020–1041.

Drost, B. (2012). An action research study: Engaging in authentic formative assessment. New Jersey: Prentice-Hall

Field, A. (2013). *Discovering Statistics Using IBM SPSS* (4th ed.). London: Sage Publications.

Fogo, B. (2014). Core practices for teaching history: The results of a Delphi panel survey. *Theory and Research in Social Education*, Vol. 42(2). Pgs 151-196.

Fry, H., Ketteridge, S. & Marshall, S. (2009). (Eds.). A Handbook for Teaching & Learning in Higher Education: Enhancing Academic Practice (3rd Ed*.).* Rutledge. New York.

Gall, M., Gall, J., & Borg, R. (2007). Educational research: An introduction (8th ed.). New York, NY: Pearson Education.

Gary T. H., Kevin C. B, and Fortner K. C. Effectiveness and Attrition. *Educational Researcher*. Vol. 40, No. 6, pp. 271 -280

Grossman, P. L., Hammerness, K., & McDonald, M. (2009). Redefining teaching, re-imaging teacher education. *Teachers and Teaching: Theory & Practice.* Vol.15 (2) Pgs 273-289.

Grossman, P. (2010). Learning to practice: The design of clinical experience in teacher preparation. Partnership for Teacher Quality. Washington, D.C.: American Association of Colleges for Teachers Education.

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). Multivariate data analysis (6th ed.). Upper saddle River, N.J.: Pearson Prentice Hall.

Hismanoglu, M., & Hismanoglu, S. (2010). English language teachers' perceptions of educational supervision in relation to their professional development: A case study of northern Cyprus. Novitas-ROYALS. *Research on Youth and Language*. Vol. 4 (1), 16-34.

Lampert, M., & Graziani, F. (2009). Instructional activities as a tool or teachers' & teacher educators' learning in and for practice. *Elementary School Journal,* Vol.109. Pgs 49-509

Marshall, (2009) Fry, H., Ketteridge, S. & Marshall, S. (2009). (Eds.). A Handbook for Teaching & Learning in Higher Education: Enhancing Academic Practice (3rd Ed.). Rutledge. New York.

Mergler, A.G. & Tangen, D.J. (2010) Using microteaching to enhance teacher efficacy in pre-service teachers. *Teaching Education*, Vol.21 (2), Pgs 199-210.

Milanowski, A. (2011). Strategic Measures of teacher Performance. *The Phi Delta Kappa* Vol. 92 (7). Pgs 19-25

Morgan, R., Whorton, J., & Gunsalus, C. (2000). A comparison of short term and long term retention: Lecture combined with discussion versus cooperative learning. *Journal of Instructional Psychology*, 27(1), 53-58.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.

Nystrand, M., Wu, L.L., Gamoran, A., Zeiser, S. & Long, D.A. (2003). Questions in time: Investigating the structure and dynamics of unfolding classroom discourse. *Discourse Processes*, Vol. 35(2). Pgs 135-198.

Orenaiya S. A. (2014). Instructional Improvement of Secondary School Teachers through Effective Academic Supervision by the Vice Principals Journal of Education and Human Development June 2014, Vol. 3(2,). Pgs 607-617

Rahman, F., Khalil, J.K., Jumani, N.B., Ajmal, M., Malik, S., & Sharif, M. (2011). Impact of discussion method on students' performance. International Journal of Business and Social Science, Special Issue-April, Vol. 2(7). Pgs. 84-94.

Roofe, C. G. & Miller, P. (2013). Miss, I Am Not Being Fully Prepared: Student - Teachers' Concerns About Their Preparation at a Teacher Training Institution in Jamaica. *Australian Journal of Teacher Education*: Vol. 38 (5).

Sampson, V., & Blanchard, M. R. (2012). Science teachers and scientific argumentation: Trends in views and practice. *Journal of Research in Science Teaching*. Vol.49. Pgs. 1122–1148.

Sampson, V. (2009, April). Science teachers and scientific argumentation: Trends in practice and beliefs. Paper presented at the 2009 International Conference of the National Association of Research in Science Teaching (NARST). Garden Grove, CA

Saunders, M., Lewis, P. & Thornhill, A. (2007) Research Methods for Business Students. 4th Edition, Financial Times Prentice Hall, Edinburgh Gate, Harlow.

Tesfaw, T. A. & Hofman, R. H. (2012). Instructional supervision and its relationship with professional development: Perception of private and government secondary school teachers in Addis Ababa

Walshaw, M. Anthony, G. (2008). Characteristics of effective pedagogy for mathematics education. In H. Forgasz, T. Barkatsas, A. Bishop, B. Clarke, P. Sullivan, S. Keast, W. T. Seah, & S. Willis (Eds.), Research in mathematics education in Australasia 2004-2007 (pp. 195-222). Rotterdam Netherlands: Sense

World Bank. (2018). World Development Report 2018: Learning to Realize Education's Promise. Washington, DC: World Bank.

Yamane, T. (1973) Statistics: An Introductory Analysis. (3rd Ed.).Harper and Row, New York.

van Zeet, E.H., Iwasyk, M. Kurose, A., Simpson, D., & Wild J. (2001). Student and Teacher Questioning during conversations about science. *Journal of Research in Science Teaching*. Vol. 38 Pgs 159-190

Zeichner, K. (2010). Rethinking the Connections Between Campus Courses & Field Experiences in College & University-Based Teacher Education. *Journal of Teacher Education.* Vol. 61(1-2). Pgs. 89-99

Zepeda, S.J (2013). Instructional Supervision: Applying Tools and Concepts. Routledge. 711 Third Avenue. New York Ny 10017 USA

Tables and Figures

Table 1
University-based learning for application of teaching methods

	Agree	Undecided	Disagree
I gained knowledge of how to apply each of the teaching methods	101	0	4
	96.2%	0.0%	3.8%
I was shown how to apply each teaching methods	59	10	36
	56.2%	9.5%	34.3%
We collaboratively planned and prepared a lesson plan with my class mates	67	6	33
	63.2%	5.7%	31.1%
I practiced all the teaching methods in a short lesson to my classmates who acted as students	55	9	42
	51.9%	8.5%	39.6%
I evaluated my application of teaching methods together with my colleagues	57	16	33
	53.8%	15.1%	31.1%
I was given a chance to re-plan and re-teach the teaching methods	6	4	95
	5.7%	3.8%	90.5%
The course helped me learn how to plan for teaching	101	1	1
	98.1%	1.0%	1.0%
The course helped me learn how to organize and sequence the content to teach and match it with appropriate teaching method	74	21	11
	69.8%	19.8%	10.4%
The course helped me learn how to assess student based on my teaching method	46	37	23
	43.4%	34.9%	21.7%
The course was relevant for my learning how to apply the teaching methods	97	3	5
	92.4%	2.9%	4.8%
I had an opportunity to do micro-teaching	69	5	30
	66.3%	4.8%	28.8%
The microteaching sessions were adequate for my learning how to teach	22	18	66
	20.8%	17.0%	62.3%
Microteaching sessions helped me learn to appropriately apply the different teaching methods appropriately	38	16	52
	35.8%	15.1%	49.1%

Tables 2

***Application of Discussion Teaching Method by B.Ed Science Students at the onset of** TP*

Statement		SD	D	U	A	SA
The teacher clarified the rules for the discussion at the outset	**Count**	5	45	2	47	7
	%	4.7%	42.5%	1.9%	44.3%	6.6%
The teacher introduced new concepts by posing it as a problem	**Count**	5	54	23	19	5
	%	4.7%	50.9%	21.7%	17.9%	4.7%
The teacher linked the content for discussion to students' daily lives	**Count**	3	48	1	45	9
	%	2.8%	45.3%	0.9%	42.5%	8.5%
The teacher ensured the students have prior knowledge of the issue to be discussed	**Count**	2	55	27	18	4
	%	1.9%	51.9%	25.5%	17.0%	3.8%
The teacher asked questions to elicit students' opinions	**Count**	3	47	4	46	6
	%	2.8%	44.3%	3.8%	43.4%	5.7%
The teacher asked questions to seek clarification	**Count**	0	6	5	74	20
	%	0.0%	5.7%	4.8%	70.5%	19.0%
The teacher integrated students responses into the discussion	**Count**	18	78	1	9	0
	%	17.0%	73.6%	0.9%	8.5%	0.0%
The teacher helped students understand concepts by providing analogies, and examples	**Count**	1	5	6	73	20
	%	1.0%	4.8%	5.7%	69.5%	19.0%
The teacher pressed students for evidence-based explanations of their opinions	**Count**	15	82	1	8	0
	%	14.2%	77.4%	0.9%	7.5%	0.0%
At appropriate points in the session the teacher summarized the major ideas on the board	**Count**	3	47	4	46	6
	%	2.8%	44.3%	3.8%	43.4%	5.7%

Total average Score of Application of Discussion Teaching Method at the onset of TP

N	Mean	%Mean	SE	SD	Skewness	SE
107	2.9644	59.3%	0.056	0.5763	0.144	0.235

Table 3: ***Application of Discussion Teaching Method by the B.Ed Science Students towards the end of TP***

Statements		SD	D	U	A	SA
The teacher clarified the rules for the discussion at the outset	**Count**	5	42	4	30	26
	%	4.7%	39.3%	3.7%	28.0%	24.3%
The teacher introduced new concepts by posing it as a problem	**Count**	1	40	17	27	22
	%	0.9%	37.4%	15.9%	25.2%	20.6%
The teacher linked the content for discussion to students' daily lives	**Count**	5	45	2	29	26
	%	4.7%	42.1%	1.9%	27.1%	24.3%
The teacher ensured the students have prior knowledge of the issue to be discussed	**Count**	0	43	15	28	21
	%	0.0%	40.2%	14.0%	26.2%	19.6%
The teacher asked questions to elicit students' opinions	**Count**	6	43	3	32	23
	%	5.6%	40.2%	2.8%	29.9%	21.5%
The teacher asked questions to seek clarification	**Count**	1	8	1	47	48
	%	1.0%	7.6%	1.0%	44.8%	45.7%
The teacher integrated students responses into the discussion	**Count**	8	70	9	10	8
	%	7.6%	66.7%	8.6%	9.5%	7.6%
The teacher helped students understand concepts by providing analogies, and examples	**Count**	3	6	2	48	47
	%	2.8%	5.7%	1.9%	45.3%	44.3%
The teacher pressed students for evidence-based explanations of their opinions	**Count**	7	74	6	11	7
	%	6.7%	70.5%	5.7%	10.5%	6.7%
At appropriate points in the session the teacher summarized the major ideas on the board	**Count**	7	42	2	31	25
	%	6.5%	39.3%	1.9%	29.0%	23.4%

Total average score of Application of Discussion method in teaching at the end of TP

N	Mean	%Mean	SE	SD	Skewness	SE
107	3.2812	65.6%	0.0742	0.7673	0.517	0.234

Table 4
Mean difference in the application of Discussion Teaching Method at the onset and towards the end of TP

	Paired Differences							
	Mean Difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper	T	Df	Sig. (2-tailed)
Pair 1	.31381	.92648	.08999	.13538	.49224	3.487	105	.001

Table 5
HoS supervision practices

Statement		Never	Rarely	Sometime	Often	Always
The subject HoS holds meetings with me to ascertain that my lesson plan is in line with the schemes of work and objectives	Count	0	16	68	19	3
	%	0.0%	15.1%	64.2%	17.9%	2.8%
The HoS guides me on how to effectively integrate teaching methods in my lesson	Count	15	46	37	5	3
	%	14.2%	43.4%	34.9%	4.7%	2.8%
My HoS advices me on the appropriate teaching method and every stage of lesson development	Count	61	29	11	2	3
	%	57.5%	27.4%	10.4%	1.9%	2.8%
My HoS provides prompt feedback	Count	1	45	46	8	4
	%	1.0%	43.3%	44.2%	7.7%	3.8%
My HoS attends my lessons to observe my teaching/learning activities on regular basis	Count	11	72	18	3	1
	%	10.5%	68.6%	17.1%	2.9%	1.0%
The assessment feedback my HoS gives me is linked to my teaching practices	Count	7	49	39	8	4
	%	6.5%	45.8%	36.4%	7.5%	3.7%
The assessment feedback my HoS gives me is timely	Count	18	56	27	4	1
	%	17.0%	52.8%	25.5%	3.8%	0.9%
I am able to use the assessment feedback I am given for subsequent teaching.	Count	13	1	18	42	32
	%	12.3%	0.9%	17.0%	39.6%	30.2%
My HoS gives me feedback that is supportive of my learning to teach so that it's clear to me how to improve my performance progressively.	Count	50	46	8	3	0
	%	46.7%	43.0%	7.5%	2.8%	0.0%
The feedback my HoS gives me shows the gap between my current and expected achievement level of my application of the teaching methods	Count	88	14	5	0	0
	%	82.2%	13.1%	4.7%	0.0%	0.0%

Total average score of performance supervision and assessment by HoSteachers

N	Mean	%Mean	SE	SD	Skewness	SE
107	2.1761	43.2%	0.0451	0.4669	0.511	0.234

Table 6

University Supervisors supervision practices

Statement		Never	Rarely	Sometime	Often	Always
The university supervisor holds meetings with me to ascertain that my lesson plan is in line with the schemes of work and objectives	**Count**	10	15	57	13	11
	%	9.4%	14.2%	53.8%	12.3%	10.4%
The university supervisor guides me on how to integrate teaching methods in my lessons	**Count**	13	29	29	23	12
	%	12.3%	27.4%	27.4%	21.7%	11.3%
The university supervisor advices me on the appropriate teaching method at every stage of my lesson development	**Count**	63	9	13	8	12
	%	60.0%	8.6%	12.4%	7.6%	11.4%
The university supervisor provides prompt feedback	**Count**	8	9	32	34	22
	%	7.6%	8.6%	30.5%	32.4%	21.0%
The university supervisor attends my lessons to observe my teaching /learning activities regularly	**Count**	12	43	29	9	12
	%	11.4%	41.0%	27.6%	8.6%	11.4%
The assessment feedback my university supervisor gives me is linked to my teaching practices	**Count**	13	1	18	42	32
	%	12.3%	0.9%	17.0%	39.6%	30.2%
The assessment feedback I'm given is timely	**Count**	13	3	17	34	39
	%	12.3%	2.8%	16.0%	32.1%	36.8%
I am able to use the assessment feedback I am given for subsequent teaching.	**Count**	13	1	18	42	32
	%	12.3%	0.9%	17.0%	39.6%	30.2%
The feedback my university supervisor gives me shows the gap between my current and expected achievement level of my application of the teaching methods	**Count**	13	3	17	34	39
	%	12.3%	2.8%	16.0%	32.1%	36.8%
Feedback I'm given helps me how to improve my teaching performance	**Count**	14	2	13	29	48
	%	13.2%	1.9%	12.3%	27.4%	45.3%

Total average score of TP performance supervision and assessment by University supervisor

N	Mean	%Mean	SE	SD	Skewness	SE
107	3.1939	63.9%	0.0921	0.9486	-0.409	0.235

Table 7

Performance of B.Ed Science students both at the onset and towards the end of the TP

Average TP Performance	Valid n	Minimum value	Maximum value	Mean		SD	Skewness	
				Statistic	SE		Statistic	SE
Overall score at the onset of TP	105	55	84	69.74	.574	5.885	.090	.236
Overall score towards end of TP	107	57	84	71.93	.579	5.994	-.292	.234
Component score at the onset of TP	103	12	23	16.97	.234	2.378	.107	.238
Component score towards end of TP	106	10	23	17.48	.274	2.819	-.388	.235

Table 8

Paired sample T test for difference in average TP performance at the onset and towards end of TP

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean Difference	SD	SE of mean	95% CI of the Difference Lower	Upper			
Pair 1	OSE – OSB	2.219	7.616	.743	.745	3.693	2.986	104	.004
Pair 2	CSE – CSB	.553	3.383	.333	-.108	1.215	1.660	102	.100

OSE: *Overall TP performance score towards the end of TP*

OSB: *Overall TP performance score at the onset of TP*

CSE: Lesson Development Component *score at towards end of TP*

CSB*: Lesson Development Component* *score at the onset of TP*